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(54) Abstract Title
Position detection

(57) A position detector is constructed from fabric and has electrically conductive elements. The fabric defines at least two electrically conducting planes 102,103. An electric potential is applied across at least one of the planes to determine the position of a mechanical interaction. In addition, a second electrical property (eg resistance) is determined to identify additional properties of mechanical interactions.

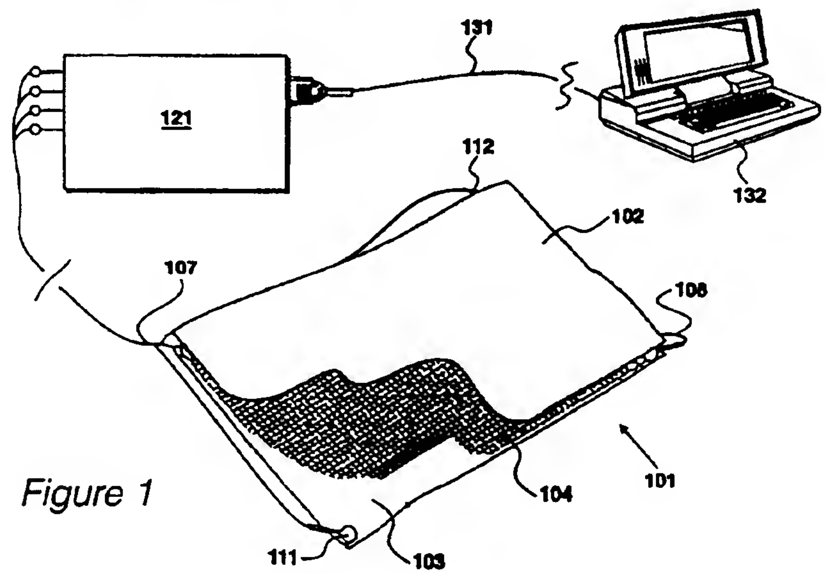


Figure 1

GB 2 341 929 A

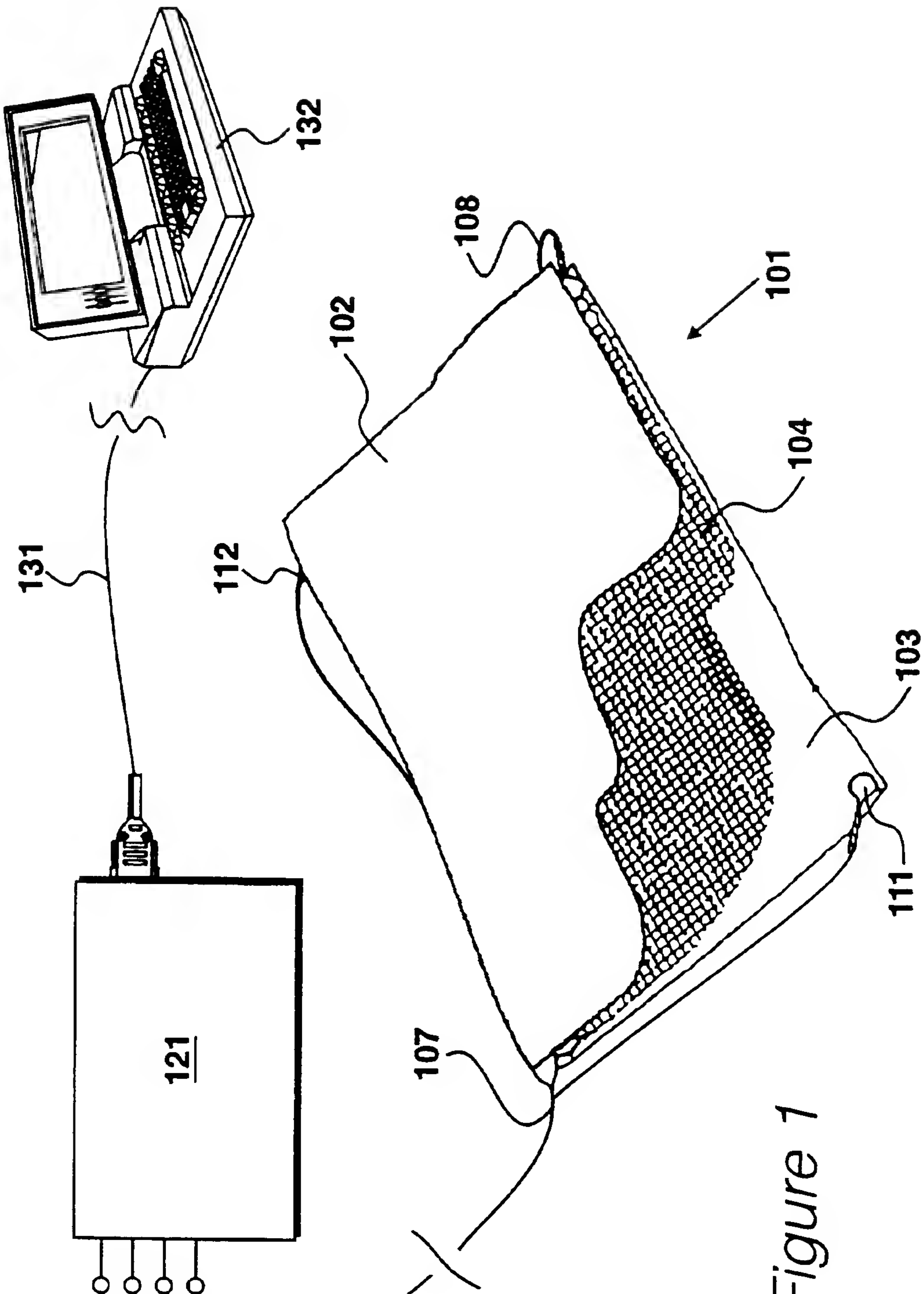


Figure 1

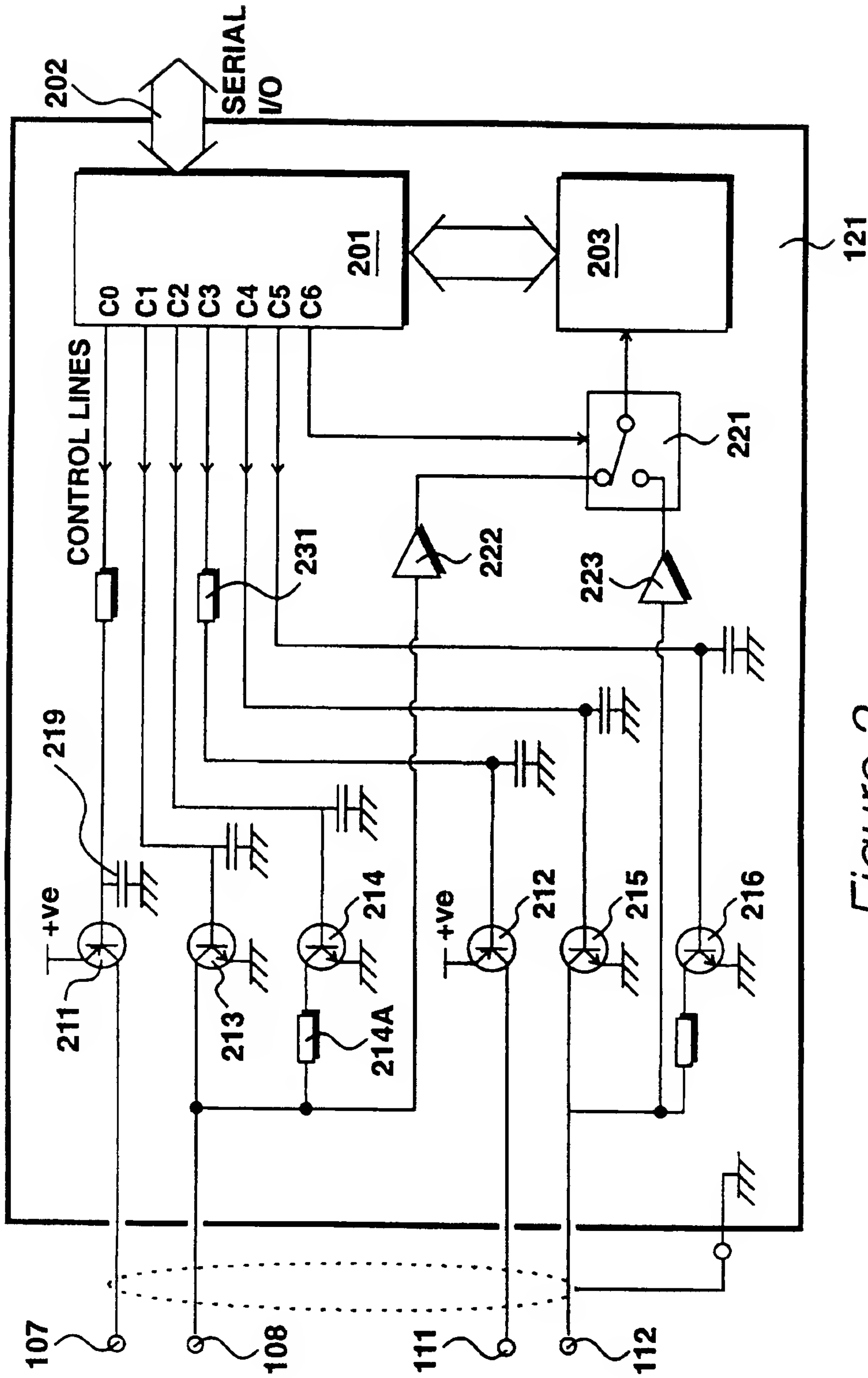
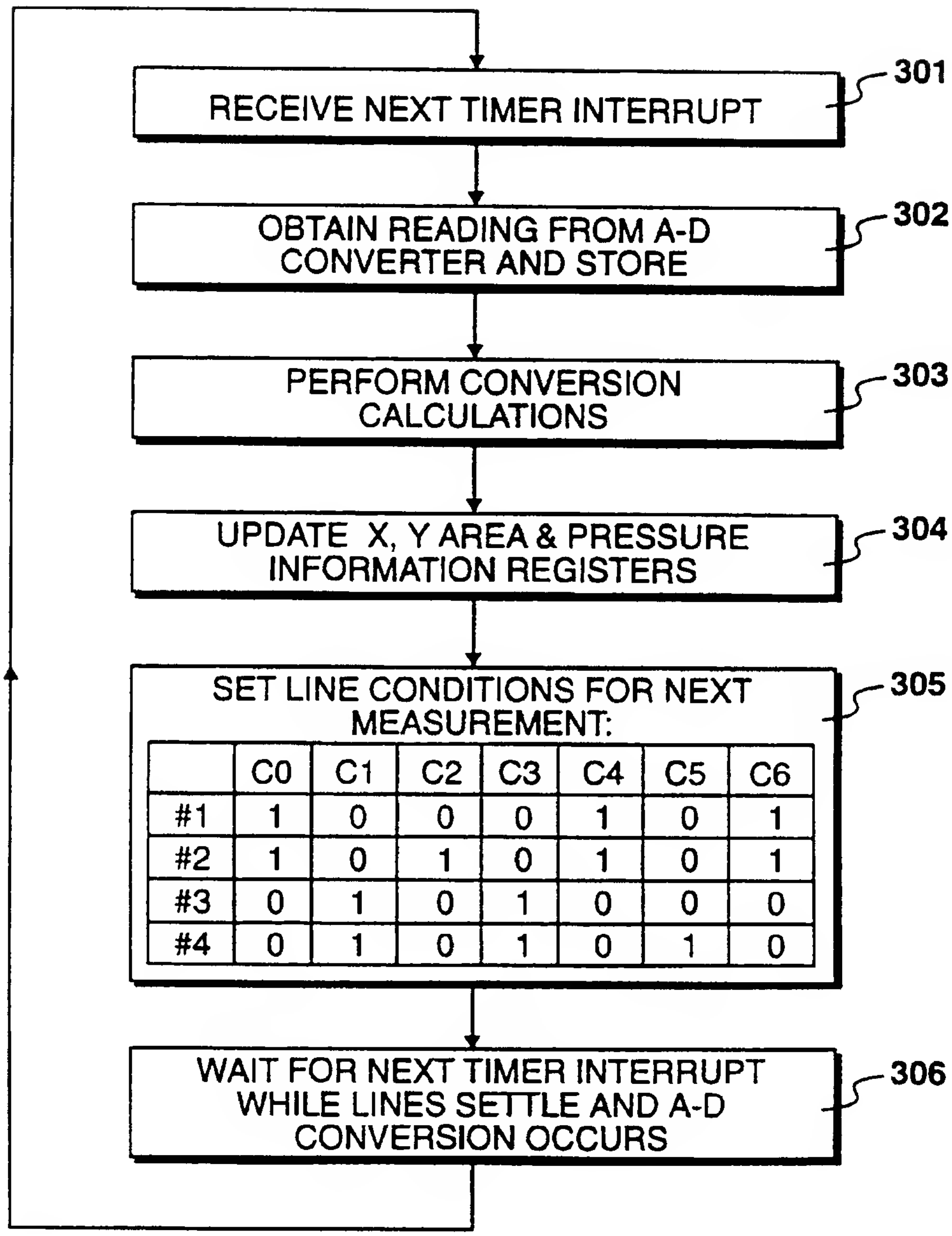

SERIAL I/O
202
201
203
121
C0
C1
C2
C3
C4
C5
C6
CONTROL LINES
221
222
223
231
219
+ve
211
213
214
214A
212
215
216
107
108
111
112

Figure 2



	C0	C1	C2	C3	C4	C5	C6
#1	1	0	0	0	1	0	1
#2	1	0	1	0	1	0	1
#3	0	1	0	1	0	0	0
#4	0	1	0	1	0	1	0

Figure 3

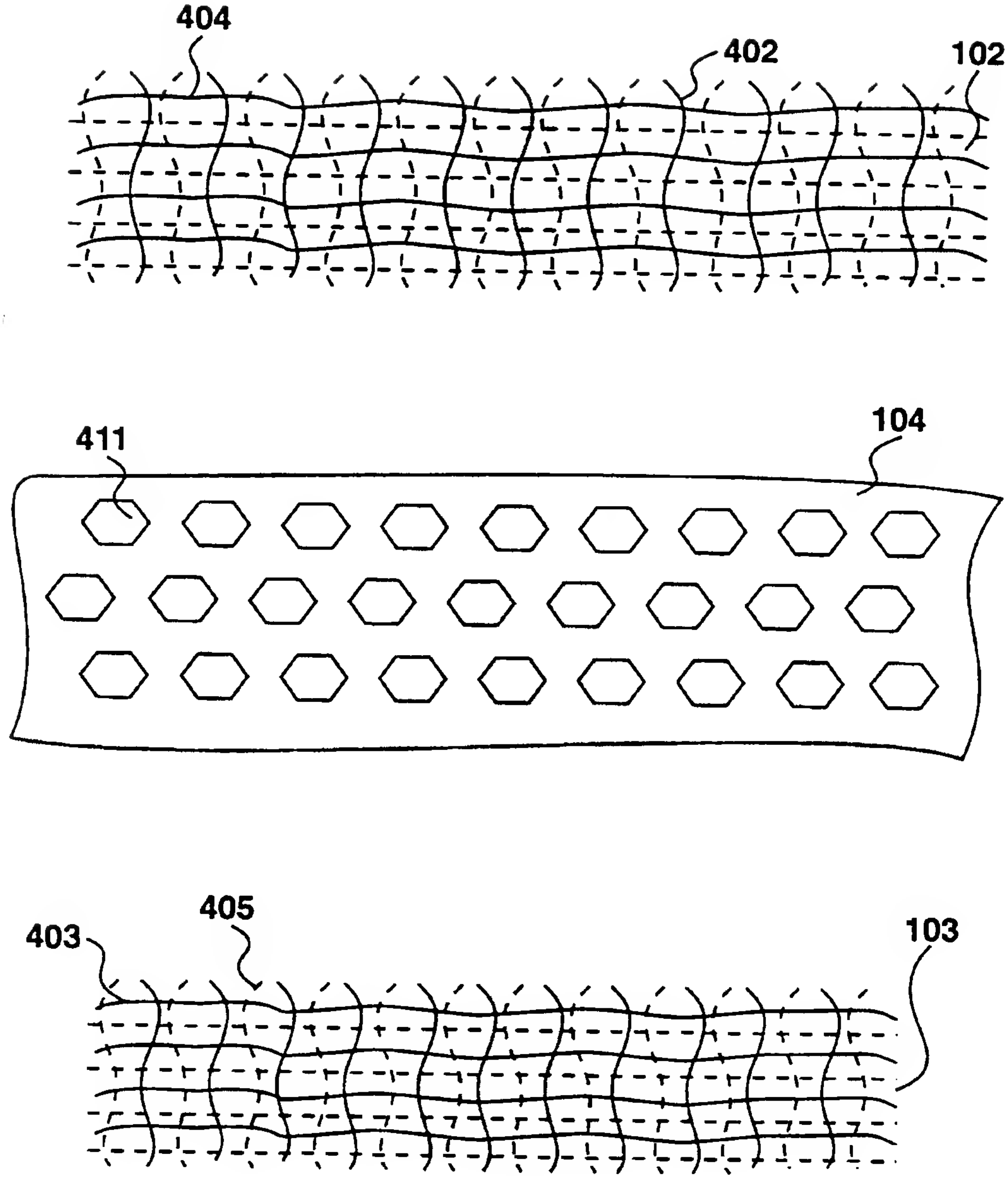


Figure 4

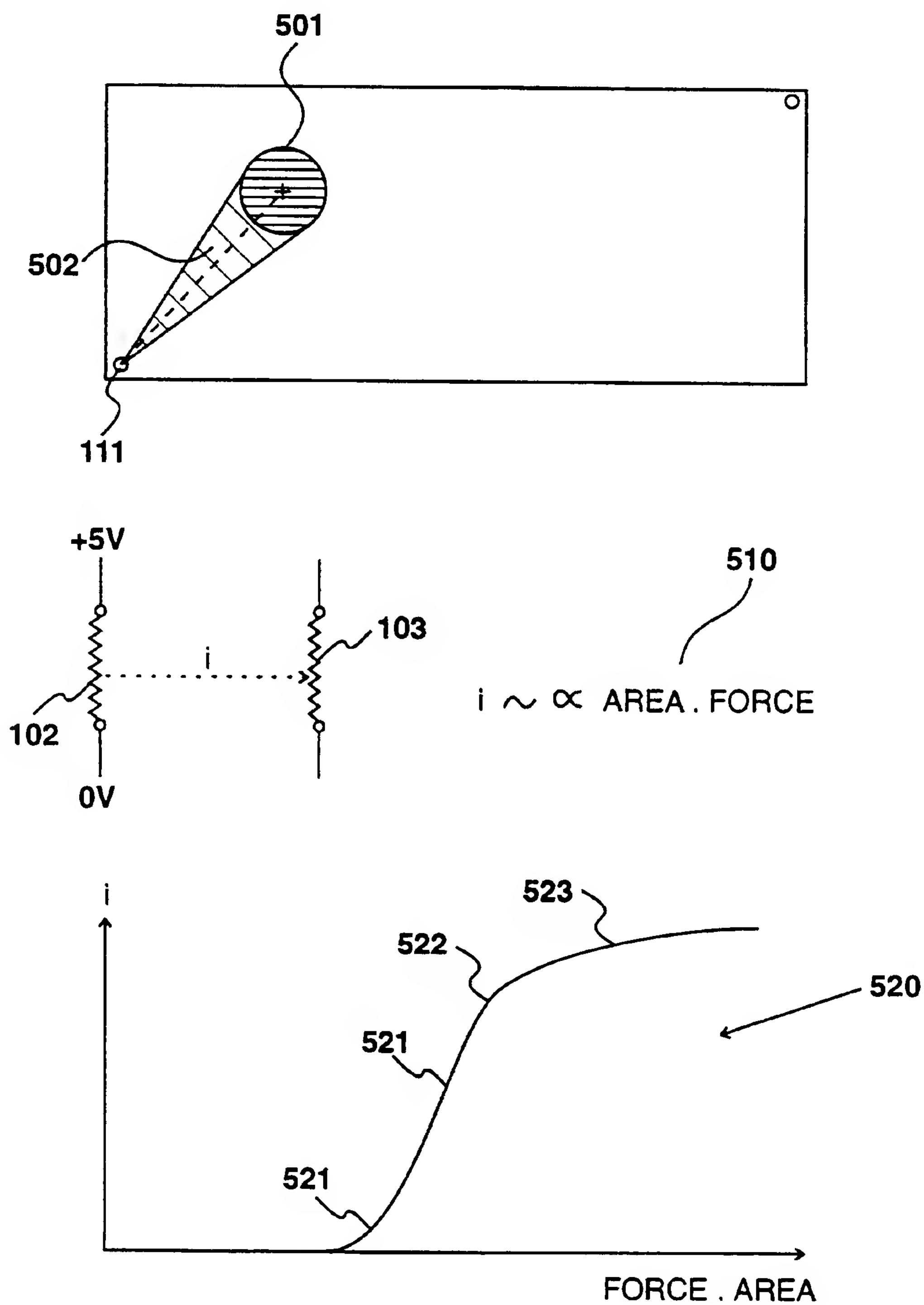

501
502
111
+5V
0V
102
103
i
510
i ~ ∝ AREA . FORCE
i
523
522
521
521
520
FORCE . AREA

Figure 5

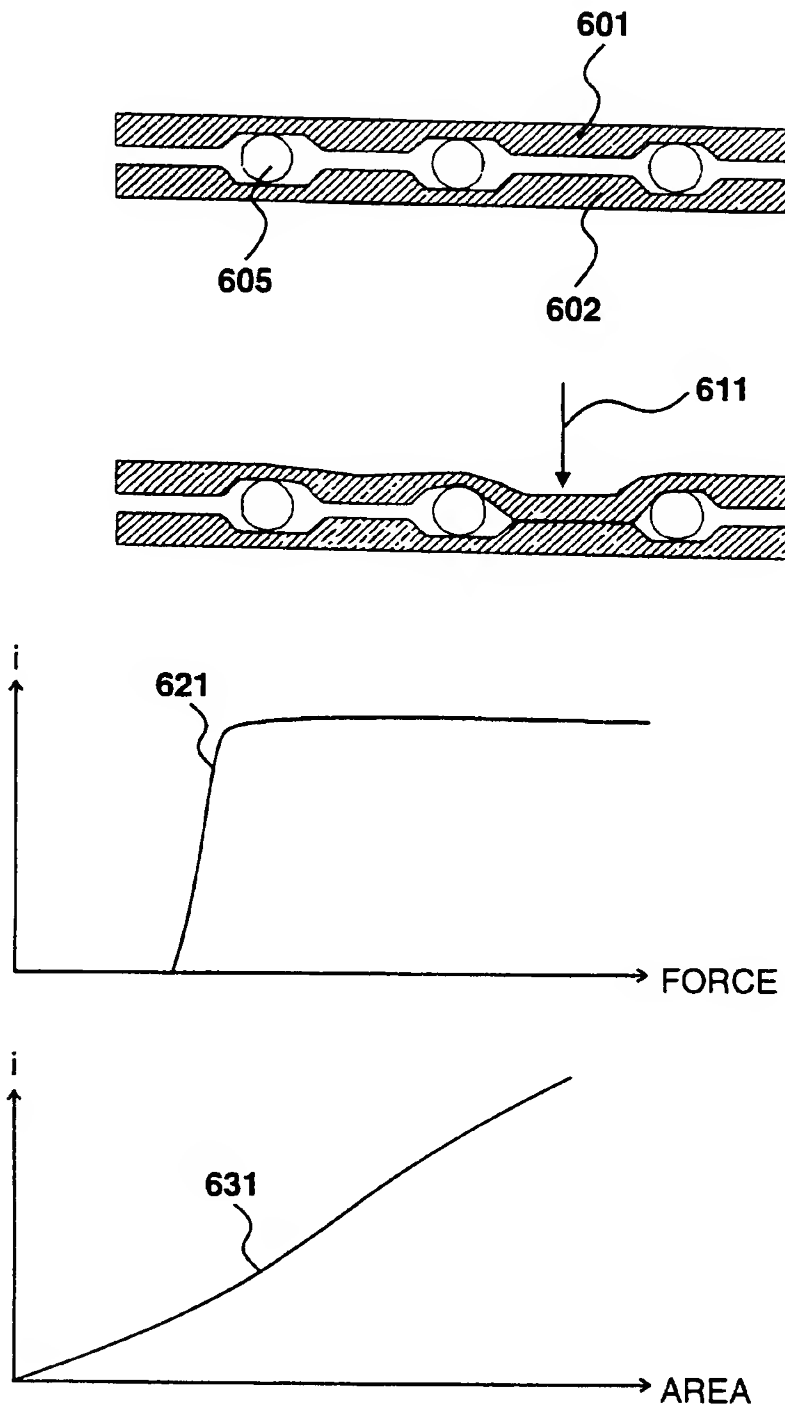


Figure 6

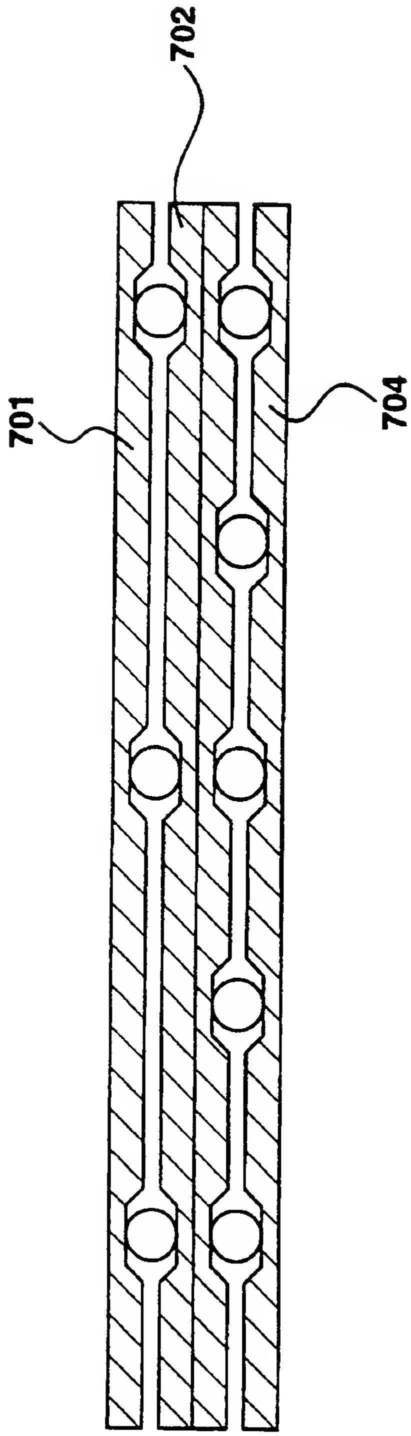


Figure 7

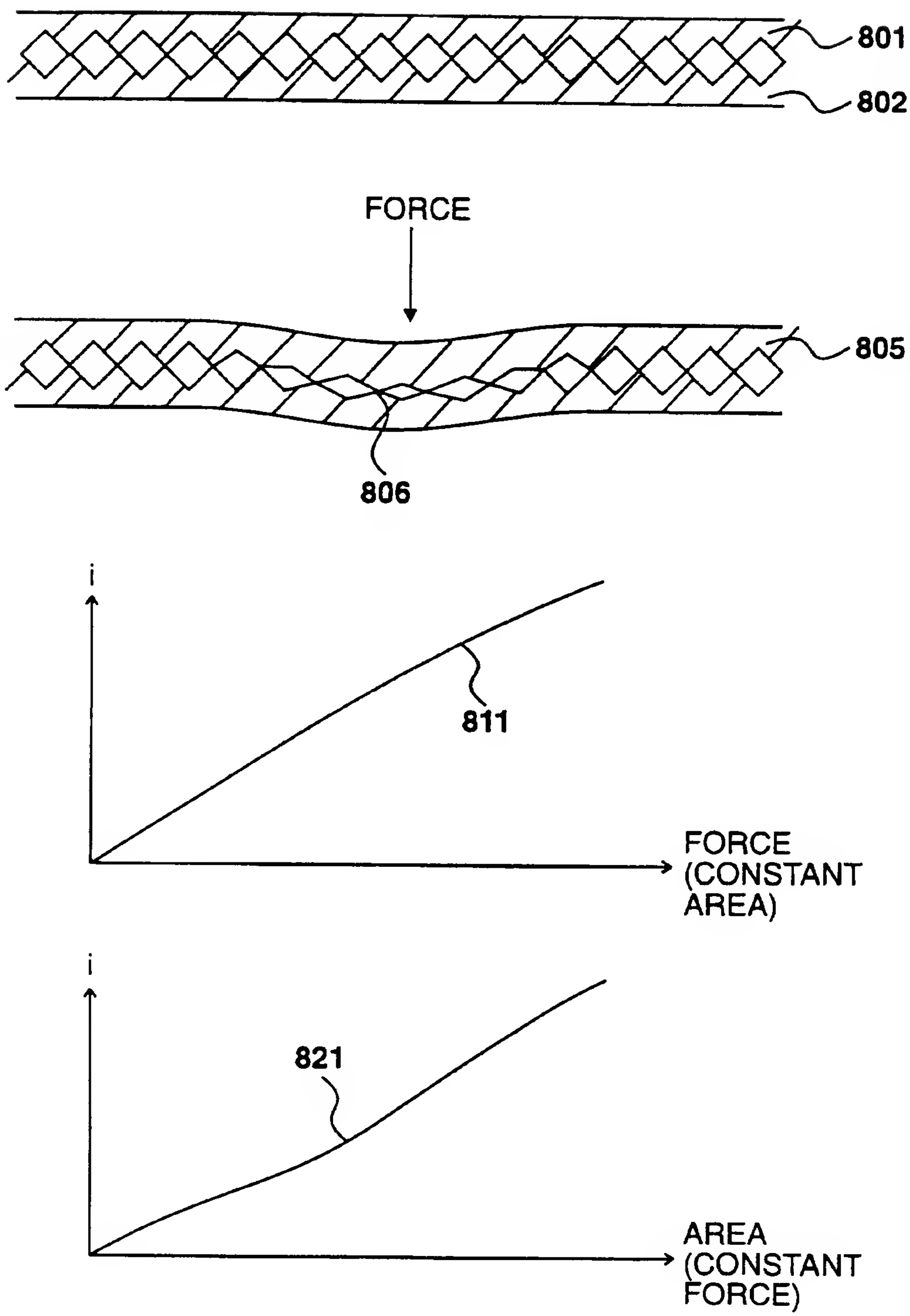

801
802
FORCE
805
806
i
811
FORCE (CONSTANT AREA)
i
821
AREA (CONSTANT FORCE)

Figure 8

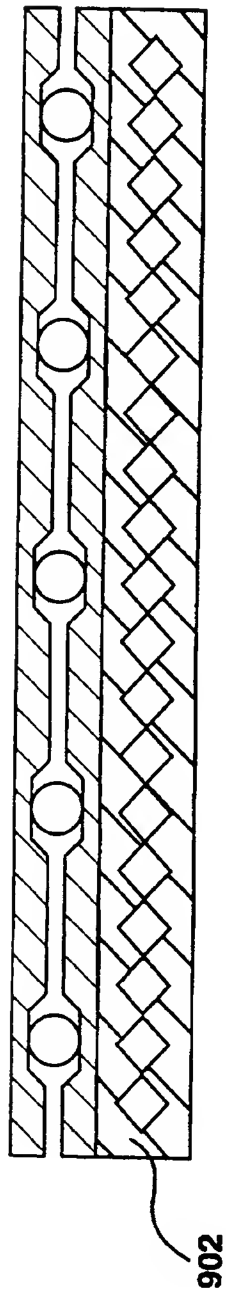


Figure 9

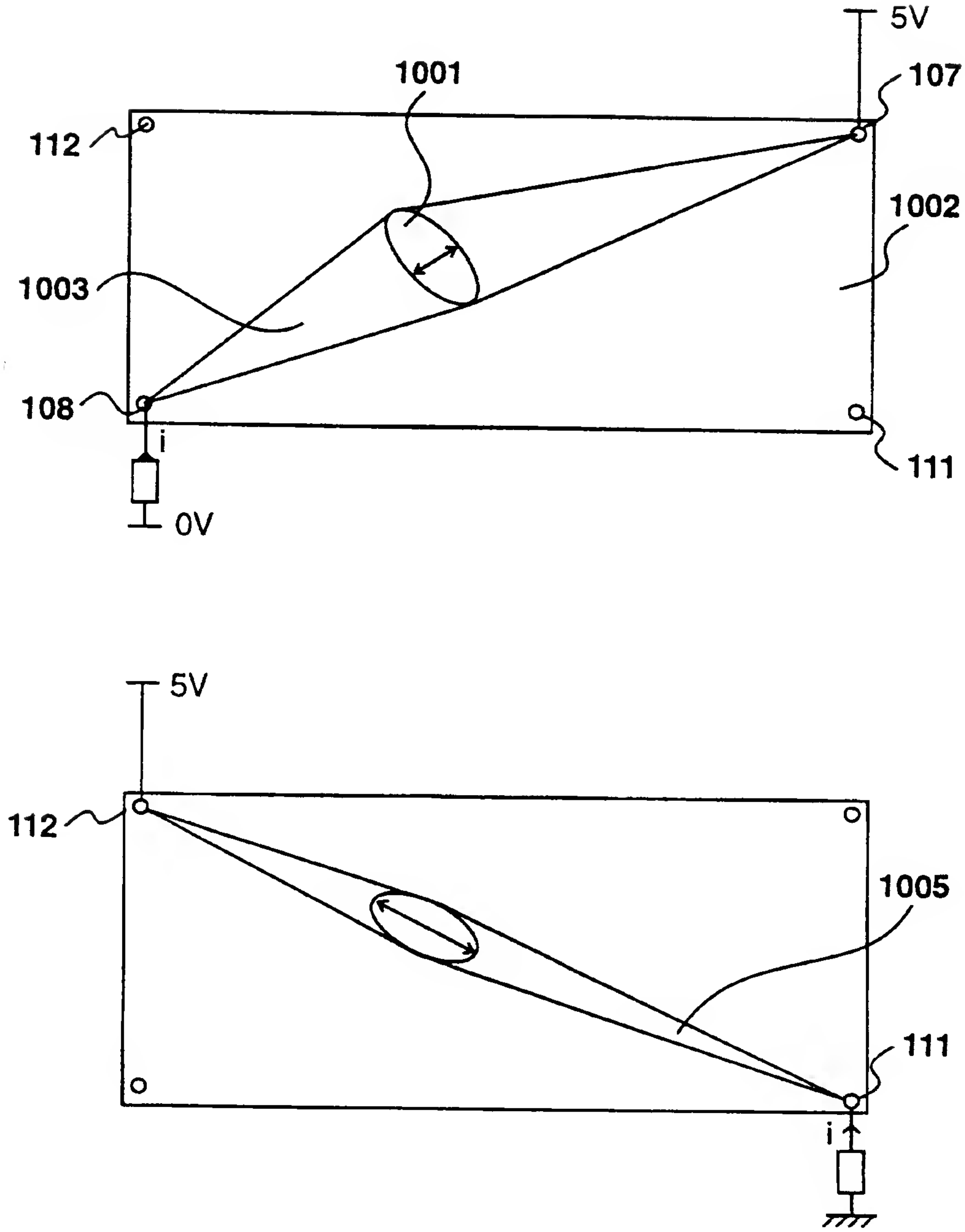


Figure 10

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Position Detection

Field of the Invention

The present invention relates to a position detector constructed from fabric having electrically conductive elements and comprising at least two electrically conducting planes, wherein a potential is applied across at least one of said planes to determine the position of a mechanical interaction.

Introduction to the Invention

A fabric touch sensor for providing positional information is described in United States patent 4,659,873 of Gibson. The sensor is fabricated using at least one resistive fabric layer in the form of conducting threads. This fabric is constructed using either uni-directional threads or crossed threads formed by overlaying one set with another or weaving the two sets together. The fabric is separated from a second resistive layer to prevent unintentional contact by separators in the form of non-conducting threads, insulator dots or with an air gap. Both resistive layers are fabrics formed from conductive threads such that no pre-forming is required in order to adapt the sensor to a contoured object.

A problem with the sensor described in the aforesaid United States patent is that it is only capable of identifying the location of the mechanical interaction and cannot provide additional information about the interaction.

Summary of the Invention

According to a first aspect of the present invention, there is provided a position detector constructed from fabric having electrically conductive elements, comprising at least two electrically conducting planes, wherein an electric potential is applied across at least one of said planes to determine the position of a mechanical interaction; and a second electrical property is determined to identify additional properties of said mechanical interaction.

Figure 9 details a composite configuration of conducting planes; and

Figure 10 shows an asymmetric object Interacting with conducting planes.

Detailed Description of The Preferred Embodiments

The invention will now be described by way of example only with reference to the previously identified drawings.

A position detector **101** constructed from fabric is shown in *Figure 1*. The detector has two electrically conducting fabric planes, in the form of a first plane **102** and a second plane **103**. The planes are separated from each other and thereby electrically insulated from each other, by means of an insulating mesh **104**, When force is applied to one of the planes, the two conducting planes are brought together, through the mesh **104**, thereby creating a position at which electrical current may conduct between planes **102** and **103**. In this way, it is possible to identify the occurrence and/or position of a mechanical interaction.

The fabric planes are defined by fabric structures, which may be considered as a woven, non-woven (felted) or knitted etc. The fabric layers may be manufactured separately and then combined to form the detector or the composite may be created as part of the mechanical construction process.

When a voltage is applied across terminals **107** and **108**, a voltage gradient appears over plane **102**. When a mechanical interaction takes place, plane **103** is brought into electrical contact with plane **102** and the actual voltage applied to plane **103** will depend upon the position of the interaction. Similarly when a voltage Is applied between connectors **111** and **112**, a voltage gradient will appear across plane **103** and mechanical interaction will result in a voltage being applied to plane **102**. Similarly, the actual voltage applied to plane **102** will depend upon the actual position of the interaction. In this way, for a particular mechanical interaction, it is possible to identify

locations within the plane with reference to the two aforesaid measurements. Thus, connectors **107**, **108**, **111** and **112** are received by a control circuit **121**, configured to apply voltage potentials to the detector **101** and to make measurements of electrical properties in response to mechanical interactions.

Control circuit **121** identifies electrical characteristics of the sensor **101** and in response to these calculations, data relating to the characteristics of the environment are supplied to a data processing system, such as a portable computer **131**, via a conventional serial interface **131**.

Control circuit **121** is detailed in *Figure* 2. The control circuit includes a micro-controller **201** such as a Philips 80C51 running at a clock frequency of twenty megahertz. Operations performed by micro-controller **201** are effected in response to internally stored commands held by an internal two kilobyte read-only memory. The micro-controller also includes one hundred and twenty-eight bytes of randomly accessible memory to facilitate intermediate storage while performing calculations. Micro-controller **201** includes a serial interface **202** in addition to assignable pins and an interface for communicating with an analogue to digital converter **203**, arranged to convert input voltages into digital signals processable by the micro-controller **201**.

The control circuit **121** includes two PNP transistors **211** and **212**, in addition to four NPN transistors **213**, **214**, **215** and **216**. All of the transistors are of relatively general purpose construction and control switching operations within the control circuit so as to control the application of voltages to the position detector **101**.

In operation, measurements are made while a voltage is applied across first plane **102** and then additional measurements are made while a voltage is applied across the second plane **103**; and output voltage only being applied to one of the planes at any particular time. When an output voltage is applied to one of the planes, plane **102** or plane **103**, input signals are received from the co-operating plane **103** or **102** respectively. Input signals are received by the analogue to digital converter **203** via a selection

switch **221**, implemented as a CMOS switch, in response to a control signal received from pin C6 of the micro-controller **201**. Thus, in its orientation shown in *Figure* 2, switch **221** has been placed in a condition to receive an output from a first high impedance buffer **222**, buffering an Input signal received from plane **102**. Similarly, when switch **221** is placed in its alternative condition, an input is received from a second high impedance buffer **223**, configured to receive an input signal from plane **103**. By placing buffers **222** and **223** on the input side of CMOS switch **221**, the switch is isolated from high voltage electrostatic discharges which may be generated in many conditions where the detector undergoes mechanical interactions.

In the condition shown in *Figure* 2, switch **221** is placed in its upper condition, receiving input signals from buffer **222**, with output signals being supplied to the second plane **103**. Further operation will be described with respect to this mode of operation and it should be appreciated that the roles of the transistor circuitry is reversed when switch **221** is placed in its alternative condition. As previously stated, condition selection is determined by an output signal from pin C6 of micro-controller **201**. In its present condition the output from pin C6 is low and switch **221** is placed in its alternative configuration when the output from pin 6 is high.

Output pin C0 controls the conductivity of transistor **211** with pins C1 to C5 having similar conductivity control upon transistors **212**, **213**, **214**, **215** and **216** respectively.

Transistors **211** and **213** are switched on when a voltage is being applied to the first plane **102** and are switched off when a voltage is being applied to the second plane **103**. Similarly, when a voltage is being applied to the second plane **103**, transistors **212** and **215** are switched on with transistors **211** and **213** being switched off. In the configuration shown in *Figure* 2, with switch **221** receiving an input from buffer **222**, output transistors **211** and **213** are switched off with output transistors **212** and **215** being switched on. This is achieved by output pin C0 being placed in a high

condition and pin C1 being placed in a low condition. Similarly, pin C3 is placed in a low condition and pin C4 is placed in a high condition.

In the configuration shown, C3 is placed in a low condition, as previously described. The micro-controller **201** includes a pull-down transistor arranged to sink current from the base of transistor **212**, resulting in transistor **212** being switched on to saturation. Consequently, transistor **212** appears as having a very low resistance, thereby placing terminal **111** at the supply voltage of five volts. Resistor **231** (4K7) limits the flow of current out of the micro-controller **201**, thereby preventing burn-out of the micro-controller's output transistor.

Pin C4 is placed in a high state, resulting in transistor **215** being placed in a conducting condition. A serial resistor is not required given that the micro-controller **201** includes internal pull-up resistors, as distinct from a pull-up transistor, such that current flow is restricted. Thus, transistors **212** and **215** are both rendered conductive, resulting in terminal **111** being placed at the positive supply rail voltage and terminal **112** being placed at ground voltage. The capacitors shown in the circuit, such as capacitor **219**, limit the rate of transistor transitions thereby reducing rf transmissions from the sensor **101**.

With transistors **212** and **215** placed in their conductive condition, input signals are received from the first plane **102** in the form of a voltage applied to terminal **108**. For position detection, this voltage is measured directly and transistor **214** is placed in a non-conductive condition by output pin C2 being placed in a low condition. Under these conditions, the voltage from input terminal **108** is applied to analogue to digital converter **203** via buffer **222** and switch **221**.

In accordance with the present invention, a second electrical property is determined which, in this embodiment, represents the current flowing through the sensor in response to a mechanical interaction. The current measurement is made by placing transistor **215** in a conductive condition, by

placing output pin C4 in a high condition. In this condition, current received at terminal **108** is supplied to transistor **214** via resistor **214A**, having a resistance of typically 5k selectable so as to correspond to the characteristics of the sensor. A voltage is supplied to A to D converter **203** via buffer **222** and switch **221** but on this occasion the voltage represents a voltage drop, and hence a current, across resistor **214A**.

Thus, transistors **212** and **215** are placed in a conducting condition, transistor **214** is placed in a non-conducting condition, so as to measure voltage, and is then placed in a conducting condition so as to measure current. The roles of the transistors are then reversed, such that output transistors **211** and **213** are placed in a conducting condition, with transistors **212** and **215** being placed in a non-conducting condition (and switch **221** reversed) allowing a voltage to be measured by placing transistor **216** in a non-conducting condition, and then allowing a current to be measured by placing transistor **216** in a conducting condition.

The cycling of line conditions, in order to make the measurements identified previously, is controlled by a clock resident within micro-controller **201**. After each condition has been set up, a twelve bit number is received from the digital to analogue converter **203** and this number is retained within a respective register within micro-controller **201**. Thus, after completing a cycle of four measurements, four twelve bit values are stored within the micro-controller **201** for interrogation by the processing device **131**. Furthermore, the rate of cycling may be controlled in response to instructions received from the processing device **131**.

Operations performed by micro-controller **201** are detailed in *Figure 3*. The micro-controller continually cycles between its four configuration states and each time a new input is produced, representing a current or a voltage in one of the two configurations, new output data is calculated on an on-going basis. Thus, output registers are updated such that the best data is made available if the micro-controller is interrupted by the external processor **131**.

The micro-controller **201** is fully interrupt driven in terms of receiving external interrupts for data interrogation along with internal interrupts in order to initiate a configuration cycle. The external interrupt has a higher priority such that external processor **131** is provided with information as soon as possible in response to making an interrupt request.

Internally interrupts for the micro-controller **201** are generated by its own internal timer and the procedure shown in *Figure 3* is effectively held in a wait state until a next timer interrupt is received at step **301**. The wait state allows voltage levels on connections **107**, **108**, **111** and **112** to become stable and provides sufficient time for valid data to be received from the analogue to digital converter **203**.

At step **302**, an output is received from analogue to digital converter **203** and at step **303** calculations are performed with respect to the most current data received from the analogue to digital converter, so as to convert numerical values relating to voltages and currents into numerical values representing properties of the mechanical interaction. Thus, after performing calculations at step **303**, appropriate registers are updated at step **304** and it is these registers that are interrogated in response to an interrupt received from processing system **131**.

At step **305** next conditions for the output lines are set by appropriate logic levels being established for output pins C0 to C6. After the next output condition has been selected, the processor enters a wait state at step **306**, allowing the electrical characteristics to settle, whereafter processing continues in response to the next timer interrupt.

Thus, it should be appreciated that on each iteration of the procedure shown in *Figure 3*, one of the output conditions is selected at step **305**. Thus, it should be appreciated that the input data is effectively delayed and does not represent a condition of the electrical characteristics at an instant. If in practice, the delay between measurements becomes too large, it becomes necessary to enhance the frequency of operation of circuits within the control

system shown in *Figure* 2. Thus, the rate of conversion for converter **203** would need to be increased and the circuitry would need to be redesigned for high frequency operation. This in turn could create problems in terms of high frequency interference resulting in enhanced shielding being required for the facility as a whole.

When output condition number one is selected, an output voltage at **108** is determined. On the next cycle, identified as output condition number two, the current flowing through connector **108** is determined. On the next iteration, under output configuration number three, the voltage appearing at connector **112** is determined and on the next cycle, identified as condition number four, the current flowing through connector **112** is determined. After each of these individual measurements, new data is generated in response to steps **303** and **304** such that resulting output registers are being regularly updated on a continual basis, such that the processing system **131** may effectively perform a continual monitoring operation in terms of changes made to the mechanical interactions with the detector **101**.

In a typical implementation, the four characteristic measurements, making up a complete cycle, will be repeated at a frequency of between twenty-five to fifty times per second. In situations where such a repetition rate is not required, it may be preferable to increase the duration of the wait states and thereby significantly reduce overall power consumption.

Planes **102, 103** and **104** of the detector **101** are detailed in *Figure 4*. Planes **101** and **103** are of substantially similar construction and are constructed from fabric having electrically conductive elements **402** in plane **102** along with similar electrical conductive elements **403** in plane **103**. Thus, it is possible for a voltage indicative of position to be determined when conductive elements **402** are placed in physical contact with conductive elements **403**.

The overall resistivity of planes **402** and **403** are controlled by the inclusion of non-conducting elements **404** and **405**. Thus, resistivity is

controlled by controlling the relative quantities and/or densities of conductive elements **402** with non-conductive elements **404**. Resistivity may also be controlled by selecting an appropriate fibre type, adjusting the thickness of the fibre or adjusting the number of strands present in a yam.

Plane **404** represents a non-conducting insulating spacer positioned between the two conducting planes **102** and **103**. Pane **104** is constructed as a moulded or woven nylon sheet having an array of substantially hexagonal holes **411**, the size of holes **411** is chosen so as to control the ease with which it is possible to bring conductive elements **402** into physical contact with conductive elements **403**. Thus, if relatively small holes **411** are chosen, a greater force is required in order to bring the conductive elements together. Similarly, if the size of the hole is increased, less force is required in order to achieve the conductive effect. Thus, the size of holes **411** would be chosen so as to provide optimal operating conditions for a particular application. Operating conditions may also be adjusted by controlling the thickness of layer **104**, its surface flexibility and the contour of co-operating planes **102** and **103**.

When a potential is applied across one of the conducting planes, the actual potential detected at a point on that plane will be related to the position at which the measurement is made. Thus, a direct voltage measurement from the co-operating plane gives a value from which a positional co-ordinate may be determined. By reversing the plurality of the planes and taking a measurement from the opposing plane, two co-ordinates are obtained from which it is then possible to identify a precise location over the planar surface.

In addition to measuring position on the planar surface, the present invention is directed at identifying additional electrical properties in order to determine properties of the mechanical interaction. As previously described, the system is configured to measure currents in addition to measuring voltages.

When the two conducting planes are brought into mechanical contact, due to a mechanical interaction, the amount of current flowing as a result of this contact will vary in dependence upon the actual position of the plane where the mechanical interaction takes place. The position of the mechanical interaction has also been determined with reference to voltages and it could be expected that these two quantities will vary in a substantially similar way, each representing the same physical situation. Experience has shown that variations in measured current do not follow exactly the same characteristic as variations in measured voltage. As illustrated in *Figure 5*, the amount of current flowing due to a mechanical interaction will depend upon the position of a mechanical interaction **501**. However, in addition to this, the amount of current flow will also depend upon the size of the mechanical interaction. As the size of the mechanical interaction increases, there is a greater area of contact and as such the overall resistance of the mechanical interaction is reduced. However, it should be appreciated that variations in terms of current with respect to interaction size is a sophisticated relationship, given that, in addition to the resistivity of the contact area **501**, the resistivity of the actual electrical connections within the sheet must also be taken into account.

Thus, current is transmitted through a region **502** in order to provide a current to the contact region **501**. Some aspects of this effect will be compensated with reference to position calculations and other variations due to this effect may be compensated by a non-linear analysis of the input data.

Contact area resistivity is illustrated generally at **510** and shows that the amount of current flowing between plane **102** and plane **103** is considered as being related to the area of mechanical interaction, which is related to the area of contact externally and to the level of externally applied mechanical force.

The resulting non-linear relationship between the force area product and the resulting current flow is illustrated generally at **520**. At **521** there is an initial threshold point, identifying the point at which the gap starts to be

closed, followed by an operational part of the curve which may give useful indications of pressure up to point **522**, whereafter the relationship becomes very non-linear until position **523** where the relationship effectively saturates.

Using a detector of the type illustrated in *Figure 1*, it is possible to measure current flow, which could also be considered as contact resistance, in order to identify an additional mechanical property of the interaction. As illustrated in *Figure 5*, this other mechanical property is related to the area of contact between the sheets, determined by the amount of force applied to the sheets, and to the total area over which the force is applied; or a combination of these two properties. Thus, data relating to force and area may give useful information relating to the interaction, separate from the position at which the interaction takes place.

In some situations, such as when using a stylus or similar implement, the area of applied force remains substantially constant therefore a measurement of current will enable calculations to be made in terms of stylus pressure. Pressure sensitive styli are known but in known configurations the pressure detection is determined within the stylus itself, leading to the stylus being mechanically connected to operational equipment or requiring sophisticated wireless transmission within the stylus itself. The present embodiment allows stylus pressure to be determined using any non-sophisticated stylus, given that the pressure detection is made by the co-operating fabric detector, arranged to detect stylus position (with reference to voltage) in combination with stylus pressure, with reference to current.

An alternative construction for the conducting fabric planes is illustrated in *Figure 6*. The detector includes a first conducting plane **601** and a second conducting plane **602**. In addition, woven into each of the conducting planes **601** and **602**, there are a plurality of non-conducting nodes **605** arranged to mutually interfere and thereby separate the two conducting planes. Between the nodes, the fabrics of the first and second planes may be brought into contact relatively easily such that the application of force,

illustrated by arrow **611** would tend to cause a finite number of regions interspersed between nodes **605** to be brought into contact. Thus, for a particular region, contact either is taking place or is not taking place as illustrated by curve **621**.

With a number of such regions brought into contact, the overall level of current flow will tend to vary with the area of contact as illustrated by curve **631**. Thus, using a construction of the type shown in *Figure 6*, it is possible to obtain a more linear relationship, compared to that shown in *Figure 5*, in which the level of current flow gives a very good indication of the area of coverage as distinct from the level of force applied to the mechanical interaction.

Given a construction of the type shown in *Figure 6*, an indication of applied force or pressure may be obtained, in addition to an accurate determination of area, by providing an incremental switching operation. In the configuration shown in *Figure 7*, there is provided a first conducting plane **701** which interacts with a second conducting plane **702**. Furthermore, conducting plane **702** interacts with a third conducting plane **704**. Conducting plane **701** is separated from conducting plane **702** by non-conducting portions **705**. Similarly, plane **702** is separated from plane **704** by non-conducting portions **706**. More non-conducting portions **705** are provided than similar non-conducting portions **706**. Consequently, less force is required to produce electrical contact between planes **701** and **702** than is required to produce an electrical contact between planes **702** and **704**. In this way, it is possible to provide an incremental measurement of force, given that a low force will only cause contact between plane **701** and plane **702** whereas a larger force will also provide electrical contact between plane **702** and **704**.

An alternative configuration is shown in *Figure 8* in which it is possible to obtain enhanced substantially continuous variations in current flow with respect to applied force. A first conducting plane **801** interacts with a second

conducting plane **802**. The planes are woven in such a way as to produce very uneven surfaces such that, under light load, the level of interaction is relatively low. As load increases, as illustrated generally at **805**, a greater level of surface contact shown at **806** is created thereby increasing the level of current flow in a substantially continuous way. It should also be noted that this configuration does not include an insulating layer as such and that a level of current flow will always take place even under conditions of zero load. Alternatively, a very thin insulating layer could be provided, having a relatively low threshold, thereby resulting in a zero current flow when no load is applied.

As shown by curve **811**, the output current varies with respect to variations in applied force for a constant load area. Similarly, as shown by curve **821**, output current varies with respect to load area for a substantially constant applied force.

A composite configuration is shown in *Figure 9*, in which a detector **901**, substantially similar to that shown in *Figure 6*, is combined with a detector **902**, substantially similar to that shown in *Figure 9*. Detector **901** provides an accurate measurement of applied area and it is relatively unaffected by applied force. Detector **902**, as shown in *Figure 8*, provides an output which varies with respect to area and force. Thus, by processing the output of these two detectors in combination, it is possible to compensate the output from detector **902** in order to produce values representing force, such that the two currents provide indications of both force and area.

The operation of the control circuit **121** is such as to apply a first voltage across diagonals **107** and **108** with a similar voltage being applied across diagonals **111** and **112**. The nature of the voltage distribution is therefore asymmetric, but this does not result in difficulties provided that the area of contact between the two planes is relatively symmetric. However, should an asymmetric area of contact be made, as illustrated in *Figure 10*, differences will occur in terms of current measurements when considering

calculations made in the two directions.

An asymmetric object **1001** is shown applied to the surface of a detector **1002**. When a voltage is applied between contact **107** and **108**, paths over which current may flow, illustrated generally at **1003** are relatively large and the object is perceived as having a large area or is perceived as applying a large force. In the opposite dimension, when a voltage is applied between **111** and **112**, the regions over which current flow takes place illustrated generally at **1105**, become relatively smaller therefore the object would be perceived as having a relatively smaller area or would be perceived as providing a relatively smaller force.

If the system is programmed to the effect that the object has a constant area and applies a constant force, these differences in terms of current flow may be processed in order to give an indication as to the orientation of the object. Thus, the system of the type illustrated in *Figure 10*, is used in combination with the detector of the type illustrated in *Figure 9* it is possible to make reference to the parameters of location in two-dimensions, force or pressure, the area of application and orientation.

In the preferred embodiment, electrical characteristics of voltage and current are measured. Alternatively, it would be possible to determine the resistance or the resistivity of the conducting sheets. Problems may be encountered when using alternating currents due to energy being radiated from the conducting sheets. However, in some situations it may be preferable to use alternating currents, in which further electrical characteristics of the detector may be considered, such as capacitance, inductance and reactance etc.

Claims

1. A position detector constructed from fabric having electrically conductive elements, comprising at least two electrically conducting planes, wherein

an electric potential is applied across at least one of said planes to determine the position of a mechanical interaction; and

a second electrical property is determined to identify additional properties of said mechanical interactions.

2. A position detector according to claim **1**, configured to measure current or resistance as said second electrical property.

3. A detector according to claim **1** or claim **2**, configured to determine applied force, applied pressure, area of contact or orientation of an object as the additional property of said mechanical interactions.

4. A detector according to any of claims **1** to **3**, including processing means for modifying a second electrical characteristic with respect to a measurement made for said first electrical characteristic.

5. A detector according to claims **1** to **4**, wherein said fabric is constructed to facilitate measurement of area or said fabric is constructed to facilitate the measurement of pressure or force.

6. A detector according to any of claims **1** to **5**, wherein composite layers of fabric are provided to enhance measurement of a property or to facilitate the measurement of multiple properties.

7. A detector according to claim 6, wherein multiple properties are measure and a measurement of a first property is used to compensate measurement of a second property.

8. A detector according to any of claims 1 to 7, wherein a stylus is applied to the detector such that a first electrical property of a mechanical interaction determines the position of the interaction and a second electrical property determines the force or pressure applied to the stylus.

9. A detector according to any of claims 1 to 7, wherein the detector interacts mechanically with parts of a human body; a first electrical property determines the position of a mechanical interaction and a second electrical property determines the area of coverage.

10. A detector according to any of claims 1 to 9, wherein electronic switching means are provided to change electrical configurations to the detector and analogue to digital conversion means are configured to convert analogue signals to digital representations of said signals for subsequent mechanical property calculations.

11. A method of detection, performed with respect to a detector constructed from fabric and having electrically conducting elements configured to provide at least two electrically conducting planes, comprising the steps of

applying a potential across at least one of said planes to determine the position of a mechanical interaction; and

measuring a second electrical property to identify additional properties of said mechanical interactions.

12. A method of detection according to claim **11**, wherein current or resistance is measured as said second electrical property.

13. A method of detection according to claim **11** or claim **12**, wherein applied force, applied pressure, area of contact or orientation of an object are determined as the additional property of a mechanical interaction.

14. A method of detection according to any of claims **11** to **13**, wherein a second electrical characteristic is modified with respect to a measurement made for the first electrical characteristic.

15. A method of detection according to any of claims **11** to **14**, further comprising the steps of constructing said fabric to facilitate measurement of area, or to facilitate measurement of pressure or force.

16. A method of detection according to any of claims **11** to **15**, further comprising the steps of providing composite layers of fabric to enhance measurement of a property or to facilitate the measurement of multiple properties.

17. A method of detection according to claim **16**, wherein multiple properties are measured and the measurement of a first property is used to compensate the measurement of a second property.

18. A method of detection according to any of claims **11** to **17**, further comprising the steps of applying a stylus to the detector, such that a first electrical property of a mechanical interaction determines the position of the stylus and a second electrical property determines the force or pressure applied by the stylus.

19. A method of detection according to any of claims **11** to **17**, wherein the detector interacts mechanically with part of a human body, a first electrical property determines the position of the mechanical interaction and a second electrical property determines the area of coverage.

20. A method of detection according to any of claims **11** to **19**, further comprising the steps of switching electrical configurations to the detector, converting analogue signals into digital signals and analysing said digital signals to produce an indication of properties of said mechanical interaction.

21. A position detector constructed from fabric substantially as herein described with reference to the accompanying Figures.

22. A method of detection, performed with respect to a detector constructed from fabric, substantially as herein described with reference to the accompanying Figures.

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Application No:	GB 9820902.6	**Examiner:**	Steven Davies
Claims searched:	1-22	**Date of search:**	31 December 1998

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Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): G1N-NACH,NACNR,NAEPR,NAGB8,NAGB10,NAGBR,NAQB ; H1N-NUJD

Int Cl (Ed.6): G06K-11/12

Other: Online databases: WPI,JAPIO

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
A	GB 2115555 A (GENERAL ELECTRIC COMPANY)	
A	EP 0172783 A2 (CYBERTRONICS)	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
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